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Searching for Optically Faint GEO Debris^{1,2}

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We report on results from a search for optically faint debris (defined as $R > 20^{\text{th}}$ magnitude, or smaller than 10 cm assuming an albedo of 0.175) at geosynchronous orbit (GEO) using the 6.5-m Magellan telescope ‘Walter Baade’ at Las Campanas Observatory in Chile. Our goal is to characterize the brightness distribution of debris to the faintest limiting magnitude possible.

Our data was obtained during 6 hours of observing time during the photometric nights of 26 and 27 March 2011 with the IMACS f/2 instrument, which has a field of view (fov) of

0.5 degrees in diameter. All observations were obtained through a Sloan r' filter, and calibrated by observations of Landolt standard stars.

Our primary objective was to search for optically faint objects from one of the few known fragmentations at GEO: the Titan 3C Transtage (1968-081) fragmentation in 1992. Eight debris pieces and the parent rocket body are in the Space Surveillance Network public catalog. We successfully tracked two cataloged pieces of Titan debris with the 6.5-m telescope, followed by a survey for unknown objects on similar orbits but with different mean anomalies.

To establish the bright end of the debris population, calibrated observations were acquired on the same field centers, telescope rates, and time period with a similar filter on the 0.6-m MODEST (Michigan Orbital DEbris Survey Telescope), located 100 km to the south of Magellan at Cerro Tololo Inter-American Observatory, Chile.

We will show the calibrated brightness distributions from both telescopes, and compare the observed brightness distributions with that predicted for various population models of debris of different sizes.

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2. This paper includes data gathered with the 6.5 meter Magellan Telescopes located at Las Campanas Observatory, Chile.